REMARKS

Claim 14 has been amended to clarify that means plus function language is not used in the claim.

Specification Amendments

Applicant made minor amendments to the specification. Specifically, a closing parenthesis was added in one paragraph. In another paragraph, Applicant changed "comparator 78" to --comparator 74--.

35 U.S.C. §103 Rejections to claims 1, 2, 4, 6-8, 13-15, 17, 19-21, and 26

The Examiner rejected claims 1, 2, 4, 6-8, 13-15, 17, 19-21, and 26 under 35 U.S.C. §103(a) as being unpatentable over Ling (U.S. Patent Publication no. 2003/0043928). Applicant respectfully disagrees.

It is noted that the previous arguments presented in the Response dated 16 December 2009 is incorporated herein by reference in its entirety. The arguments given in that Response are valid. The present arguments add to the previous arguments.

Claim 1 recites the following:

> A method to operate a digital signal receiver, comprising:
>
> detecting occurrence of a symbol degrading event for a received signal, wherein the symbol degrading event occurs after transmission and before reception of the received signal;
>
> inserting zero symbols into a received symbol stream to replace symbols degraded by the signal degrading event prior to de-interleaving the received signal; and
>
> error correction decoding the received symbol stream having the inserted zero symbols.

In this independent claim (and the other independent claims 14, 27, 30, and 31), zero symbols are inserted into a received symbol stream to replace symbols degraded by a detected symbol degrading event. The Examiner asserts that this is "obvious" in light of Ling, but the Applicant respectfully disagrees and presents several arguments below as to why this is not obvious in light of Ling.

The Examiner states the following about claim 1:

> Ling et al. disclose all of the subject matter as described above except for specifically teaching to replace symbols degraded by the signal degrading event. However, based on the cited portions of the ling et al. reference, it would have been obvious to one of ordinary skilled in the art at the invention was made to use the method of zero insertion as taught by Ling et al. to insert zero to "replace symbols degraded by the signal degrading event" (fading) in order to combat signal fading.

Outstanding Office Action, page 4. The Examiner therefore implies that one skilled in the art, reviewing Ling, would insert zero symbols to replace symbols degraded by a signal degrading event and such insertion is obvious in order to combat signal fading.

Applicant will now examine every single instance in which Ling mentions fading in order to determine the types of information one skilled in the art could obtain regarding fading from Ling. Regarding fading, what Ling states is the following (emphasis added):

> Coding techniques for a (e.g., OFDM) communication system capable of transmitting data on a number of "transmission channels" at different information bit rates based on the channels' achieved SNR. A base code is used in combination with common or variable puncturing to achieve different coding rates required by the transmission channels. The data (i.e., information bits) for a data transmission is encoded with the base code, and the coded bits for each channel (or group of channels with the similar transmission capabilities) are punctured to achieve the required coding rate. The coded bits may be interleaved (e.g., **<u>to combat fading</u>** and remove correlation between coded bits in each modulation symbol) prior to

> puncturing. The unpunctured coded bits are grouped into non-binary symbols and mapped to modulation symbols (e.g., using Gray mapping). The modulation symbol may be "pre-conditioned" and prior to transmission.

Abstract of Ling. That is, coded bits are interleaved, and this interleaving helps to combat fading. This cited text does not teach or imply insertion of zero symbols to replace symbols degraded by a signal degrading event, e.g., fading.

Ling also states the following (emphasis added):

> [0006] The frequency subchannels of an OFDM system may experience different link conditions (e.g., different **fading** and multipath effects) and may achieve different signal-to-noise-plus-interference ratio (SNR). Consequently, the number of information bits per modulation symbol (i.e., the information bit rate) that may be transmitted on each subchannel for a particular level of performance may be different from subchannel to subchannel. Moreover, the link conditions typically vary with time. As a result, the supported bit rates for the subchannels also vary with time.

That is, different frequency subchannels of an OFDM system may experience different fading. This cited text does not teach or imply insertion of zero symbols to replace symbols degraded by a signal degrading event, e.g., fading.

Ling also states the following (emphasis added):

> [0025] As shown in FIG. 1, communication system 100 includes a first system 110 in communication with a second system 150. Within system 110, a data source 112 provides data (i.e., information bits) to an encoder 114 that encodes the data in accordance with a particular coding scheme. The encoding increases the reliability of the data transmission. The coded bits are then provided to a channel interleaver 116 and interleaved (i.e., reordered) in accordance with a particular interleaving scheme. The interleaving provides time and frequency diversity for the coded bits, permits the data to be transmitted based on an average SNR for the subchannels used for the data transmission, **combats fading**, and further removes correlation between coded bits used to form each modulation symbol, as described below. The interleaved bits are then punctured (i.e., deleted) to provide the required number of coded bits. The encoding, channel interleaving, and puncturing are described in further detail below. The unpunctured coded bits are then provided to a symbol mapping element 118.

Again, this states that interleaving (that is, reordering bits) combats fading. This cited text does not teach or imply insertion of zero symbols to replace symbols degraded by a signal degrading event, e.g., fading.

Ling states the following (emphasis added):

> [0084] Referring back to FIG. 1, the coded bits from encoder 114 are interleaved by channel interleaver 116 to provide temporal and frequency diversity against deleterious path effects **(e.g., fading)**. Moreover, since coded bits are subsequently grouped together to form non-binary symbols that are then mapped to modulation symbols, the interleaving further ensures that the coded bits that form each modulation symbol are not located close to each other (temporally). For static additive white Gaussian noise (AWGN) channels, the channel interleaving is less critical when a Turbo encoder is also employed, since the code interleaver effectively performs similar functions.

This text again asserts that bits are interleaved to reduce effects from fading. This cited text does not teach or imply insertion of zero symbols to replace symbols degraded by a signal degrading event, e.g., fading.

Applicant has examined every instance in Ling that discussed fading, and none of them teach or imply insertion of zero symbols to replace symbols degraded by a signal degrading event, e.g., fading.

Regarding zeros, Ling states the following (emphasis added):

> [0029] In the embodiment shown in FIG. 1, receiving system 150 includes a number of receive antennas 152 that receive the transmitted signals and provide the received signals to respective demodulators (DEMOD) 154. Each demodulator 154 performs processing complementary to that performed at modulator 122. The demodulated symbols from all demodulators 154 are provided to a MIMO processor 156 and processed in a complementary manner as that performed at MIMO processor 120. The received symbols for the transmission channels are then provided to a bit calculation unit 158 that performs processing complementary to that performed by symbol mapping element 118 and provides values indicative of the received bits. **Erasures (e.g., zero value indicatives) are then inserted by a de-puncturer 159 for coded bits punctured at system 110.** The de-punctured values are then

> deinterleaved by a channel deinterleaver 160 and further decoded by a decoder 162 to generate decoded bits, which are then provided to a data sink 164. The channel deinterleaving, de-puncturing, and decoding are complementary to the channel interleaving, puncturing, and encoding performed at the transmitter.

The erasures in this section of Ling are to replace bits at the receiver that were punctured (that is, written over) at the transmitter. That this is true is specifically states in Ling:

> [0139] De-puncturer 159 then inserts **"erasures" for code bits that have been deleted (i.e., punctured) at the transmitter**. The erasures typically have a value of zero ("0"), which is indicative of the punctured bit being equally likely to be a zero or a one.

Thus, the erasures replace bits that were previously deleted at the transmitter. It is noted that these bits do not have to have a value of zero; a value of one could be used, as both zero and one are equally likely (according to paragraph 0139 of Ling). The erasures in Ling are in no way explicitly or implicitly related to signal degrading events, as recited generally in independent claim 1.

Respectfully, the Examiner has produced no evidence that one skilled in the art would insert zero symbols into a received symbol stream in the system of Ling to replace symbols degraded by a signal degrading event prior to de-interleaving a received signal. Certainly, none of the text of Ling indicates that inserting zeros into a received symbol stream to replace symbols degraded by a signal degrading event has the effect of combating fading, as the Examiner asserts. All evidence in Ling indicates that erasures in Ling are performed to replace previously punctured bits and that bits are interleaved to reduce effects from fading. Respectfully, there is no teaching or implication in Ling that one should insert zero symbols into a received symbol stream in the system of Ling to replace symbols degraded by a signal degrading event prior to de-interleaving a received signal.

For at least these reasons, claim 1 is patentable over Ling.

Because claim 1 is patentable, the other independent claims 14, 27, 30, and 31 are also patentable for at least the same reasons given for claim 1. For example, claim 14

recites "circuitry configured to detect the occurrence of a symbol degrading event for a received signal; and configured to insert zero symbols into a received symbol stream to replace symbols by the symbol degrading event prior to de-interleaving the received signal, wherein the symbol degrading event occurs after transmission and before reception of the received signal; and a decoder configured to decode the received symbol stream having the inserted zero symbols." Claim 27 recites "detecting occurrence of a fading condition due to obstruction by the propeller blade; in response to detecting the óccurrence of the fading condition, inserting zero symbols into a received symbol stream at the receiver to replace symbols degraded by the fading condition caused by the obstructing propeller blade; de-interleaving the received symbol stream having the inserted zero symbols". Claim 30 recites "detecting, on the satellite, occurrence of a fading condition due to obstruction by the propeller blade; in response to detecting the occurrence of the fading condition, inserting zero symbols into a received symbol stream at the satellite to replace symbols degraded by the fading condition caused by the obstructing propeller blade; de-interleaving the received symbol stream having the inserted zero symbols". Claim 31 recites "A satellite, comprising a receiver for receiving a signal that passes through a channel that is periodically obstructed, the receiver comprising circuitry for detecting occurrence of a fading condition due to an obstruction and, in response to detecting the occurrence of the fading condition, for inserting zero symbols into a received symbol stream to replace symbols corrupted by the fading condition caused by the periodic obstruction; and an error correction decoder for decoding the received symbol stream having the inserted zero symbols."

Because independent claims 1, 14, and 27 are patentable, their dependent claims 2-13, 15-27, 28, and 29 are also patentable for at least the reasons given above with respect to claim 1.

The Examiner rejected claims 3, 5, 16, and 18 under 35 U.S.C. §103(a) as being unpatentable over Ling in view of Koetter (U.S. Patent no. 6,634,007). Because independent claims 1 and 14 are patentable, their dependent claims 3, 5, 16 and 18 are also patentable for at least the reasons given above with respect to claim 1.

The Examiner rejected claims 9-12 and 22-25 under 35 U.S.C. §103(a) as being unpatentable over Ling in view of Slack (U.S. Patent no. 4,574,252). Because independent claims 1 and 14 are patentable, their dependent claims 9-12 and 22-25 are also patentable for at least the reasons given above with respect to claim 1.

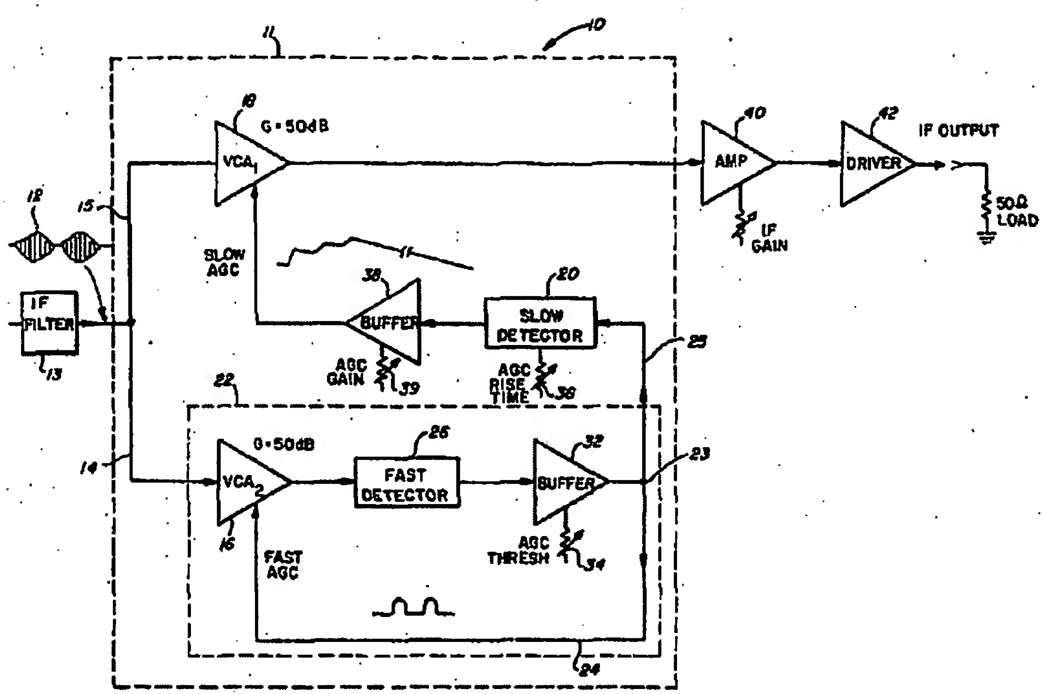
Regardless, claim 9 recites "A method as in claim 1, where detecting comprises examining the output of at least one Automatic Gain Control (AGC) circuit." In claim 1, "detecting" is "detecting occurrence of a symbol degrading event for a received signal, wherein the symbol degrading event occurs after transmission and before reception of the received signal". In other words, detecting an occurrence of a symbol degrading event is performed at least by an AGC circuit.

The Examiner states the following:

> One of ordinary skill in the art would have clearly recognized Receivers for mobile communication systems include Automatic Gain Control (AGC) subsystems,
>
> which attempt to minimize the fluctuations in the received signal energy and consequently amplitude. In order to accomplish an approximately constant received signal energy, it would have been obvious to one ordinary skill in the art at the time the invention was made to include a AGC circuit in the system as taught by Slack et al. To adjust the signal power level, it is advantageous to use an Automatic Gain Control subsystem to achieve the appropriate power level in the received signal.

Outstanding Office Action, pages 9-10. Even if the Examiner's argument shown immediately above is true (to which Applicant does not admit), there is still no reason given why one skilled in the art would combine Slack's AGC subsystem with Ling's coding techniques in order to perform the claimed ***detecting an occurrence of a symbol degrading event*** by using an AGC circuit. One skilled in the art that combined Ling and Slack still would not create a system that has all the claimed features of claims 9 and 1.

FIG. 1 of Slack is shown below:



What Slack states about fading is the following:

> A secondary AGC loop 22 is provided within the primary AGC loop 11. The secondary AGC loop includes the input component 16 and has its output split at 23 for feedback to the input component 16 via lead 24 and for connection to the slow detector 20 via lead 25. The secondary AGC loop 22 is provided with a fast detector 26 for preventing saturation of the input component 16. The fast detector 26 has a time constant which is faster than the rise time of the IF filter 13 outputting the input signal 12. With this arrangement the secondary AGC loop 22 can be utilized to provide a constant AGC buildup signal for any input signal greater than a predetermined dB range. **The remainder of the primary AGC loop 11,** which receives the constant AGC buildup signal from the secondary AGC loop 22, **can be optimized for desired rise and fall times so that the latter's output signal can be relatively unaffected by** interference bursts, data gaps, and **fading in the input signal**.

Slack, col. 2, lines 24-42. That is, the output of the AGC is relatively unaffected by fading in the input signal. Being that this is the case, one skilled in the art would not use the system of Slack to detect an occurrence of a symbol degrading event for a received signal, as the output of the ACG of Slack is "relatively unaffected by ... fading in the input signal".

For at least these reasons, claim 9 is patentable over the combination of Slack and Ling. Claim 22, which recites subject matter similar to the subject matter in claim 9 is also patentable for at least these reasons.

It is noted that similar reasoning is also valid for claims 10-12 and 23-25. Thus, these claims are also patentable over the combination of Slack and Ling.

Regarding claims 27-31, the Examiner rejected these claims as being unpatentable over Ling in view of "Shor et al." and in further view of Rogards (U.S. Patent no. 4,718,066). Although the Examiner makes no mention that Applicant can find of what reference "Shor et al." is, it is believed this is Shor, U.S. Patent Publication no. 2004/0174809. If that is not the case, Applicant requests a new set of rejections in a non-final Office Action in order to respond to proper rejections. The Examiner has cited "Shor et al." in the following:

> **9. Claims 27- 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ling et al. in view of Shor et al. and further in view of Rogards et al. (Us 4,718,066).**

Outstanding Office Action, page 13. However, the rest of the rejections for claims 27-31 appear not to use "Shor et al.". Is "Shor et al." being used for these rejections? It is assumed herein that the inclusion of "Shor et al." is not correct and is ignored. However, if that is not the case, Applicant requests a new set of rejections in a non-final Office Action in order to respond to proper rejections.

Assuming that "Shor et al." is incorrectly cited (or for that matter is cited correctly), Applicant respectfully disagrees with these rejections. As stated above, the

Examiner has produced no evidence that one skilled in the art would insert zero symbols into a received symbol stream in the system of Ling to replace symbols degraded by a signal degrading event prior to de-interleaving a received signal. Certainly, none of the text of Ling indicates that inserting zeros into a received symbol stream to replace symbols degraded by a signal degrading event have the effect of combating fading, as the Examiner asserts. All evidence in Ling indicates that erasures in Ling are performed to replace previously punctured bits and that bits are interleaved to reduce effects from fading. Respectfully, there is no teaching or implication in Ling that one should insert zero symbols into a received symbol stream in the system of Ling to replace symbols degraded by a signal degrading event prior to de-interleaving a received signal. For at least these reasons, independent claims 27, 30, and 31 are patentable over Ling.

With regard to Rogards, Rogards does not cure these defects. In terms of erasures or zeros, what Rogards states is the following:

> The error detection capacity is a number less than or equal to (N-K)/2 errors, whatever their distribution.
>
> The erasure correction capacity is identical to the error detection capacity.
>
> An erasure is a symbol identified as being incorrect or declared incorrect a priori. Arbitrarily, reception of a "zero" symbol is assumed.
>
> By way of example, a coded block characterized by the couple (N,K)=(16,12) enables:
>
> detection of up to 4 errors
>
> correction of up to 2 errors
>
> correction of up to 4 erasures.
>
> For a couple (N,K)=(16,8), correction of up to 8 erasures is achieved.

Rogards, col. 5, lines 1-14. Thus, Rogards also does not disclose at least the subject matter of "detecting occurrence of a fading condition due to obstruction by the propeller blade; in

response to detecting the occurrence of the fading condition, inserting zero symbols into a received symbol stream at the receiver to replace symbols degraded by the fading condition caused by the obstructing propeller blade; de-interleaving the received symbol stream having the inserted zero symbols" in claim 27. Therefore, the combination of Ling and Rogards does not disclose this subject matter.

Claim 27 is patentable over the combination of Ling and Rogards. Because claim 27 is patentable, independent claims 30 and 31, which recite certain similar subject matter to the subject matter in claim 27, are also patentable for at least the reasons given with respect to claim 27. Because claim 27 is patentable, its dependent claims 28 and 29 are also patentable.

It is noted that Applicant is not acquiescing to any of the combinations of references the Examiner has presented. Instead, such combinations need not be examined at this time.

Conclusion

Based on the foregoing arguments, it should be apparent that claims 1-31 are thus allowable over the reference(s) cited by the Examiner, and the Examiner is respectfully requested to reconsider and remove the rejections. The Examiner is invited to call the undersigned attorney for any issues.

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Respectfully submitted:

Robert J. Mauri
Reg. No.: 41,180

6/14/2010
Date

Customer No.: 29683

HARRINGTON & SMITH, Attorneys at Law, LLC

4 Research Drive
Shelton, CT 06484-6212

Telephone: (203)925-9400
Facsimile: (203)944-0245
email: rmauri@hspatent.com

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